

16 March 2022

Jasmine Lock

By email: fyi-request-18576-62c57945@requests.fyi.org.nz

Dear Jasmine

I refer to your information request dated 16 February 2022 made under the Official Information Act 1982 (Act). You requested information regarding the average time for PhD completions and deferrals in the Division of Health Sciences and Division of Sciences, broken down by year since 2010.

We note we contacted you 1 March 2022 to advise that the University did not have readily to hand all of the information you have requested, and asked whether you would be willing to accept the data we held for the years 2000 – 2010 plus information we held on the medians for time to completion for the years 2015 – 2019. At the time we advised that it would take extensive staff time and research to collate the remaining information you had requested.

Your email of 9 March 2022 confirmed that you were happy to receive the information that the University had readily to hand.

Subject to the following comment, please see below the information the University currently holds that is within the agreed revised scope of your request.

- Please note that all tables in our response are based on EFTS consumed, which is a measure of a student's period of active enrolment as an equivalent full-time student. For example, if a student studies part-time for a year, they will consume 0.5 EFTS over the course of a calendar year. A student undertaking a typical full-time year's study will consume 1.0 EFTS.

Completion time

Please see the below a table which shows the number of PhD students, the median time to submission of a PhD, and the average PhD completion time for the Division of Health Sciences and the Division of Sciences, broken down by year from 2000 – 2010 and 2015 – 2020. As noted to you in our email of 1 March 2022, for some years the University does not currently have the full set of data readily to hand.

| Year | Division of Health Sciences | | | Division of Sciences | | |
|------|-----------------------------|--------------------------------------|------------------------------------|----------------------|--------------------------------------|------------------------------------|
| | Headcount | Median time to PhD submission (EFTS) | Average PhD completion time (EFTS) | Headcount | Median time to PhD submission (EFTS) | Average PhD completion time (EFTS) |
| 2000 | | 4.85 | | 50 | 3.89 | |
| 2001 | | 4.16 | | 26 | 4.12 | |
| 2002 | | 4.70 | | 56 | 3.58 | |
| 2003 | | 4.08 | | 47 | 3.62 | |
| 2004 | | 3.97 | | 57 | 3.57 | |
| 2005 | | 4.06 | | 44 | 3.66 | |
| 2006 | | 3.77 | | 84 | 3.82 | |
| 2007 | | 3.80 | | 74 | 3.83 | |
| 2008 | | 3.80 | | 68 | 3.87 | |
| 2009 | | 3.40 | | 103 | 3.40 | |
| 2010 | | 3.37 | | 76 | 3.19 | |
| 2015 | 95 | 3.50 | 3.50 | 87 | 3.50 | 3.80 |
| 2016 | 101 | 3.40 | 3.50 | 63 | 3.80 | 4.20 |
| 2017 | 92 | 3.50 | 3.50 | 82 | 3.60 | 3.60 |
| 2018 | 110 | 3.40 | 3.50 | 70 | 3.30 | 3.70 |
| 2019 | 86 | 3.40 | 3.60 | 90 | 3.30 | 3.60 |
| 2020 | 91 | 3.30 | 3.50 | 79 | 3.10 | 3.30 |

Deferrals

Please below a table which shows the average length of deferrals for PhDs in the Division of Health Sciences and the Division of Sciences, broken down by year from 2000 – 2010.

| Year | Average length of deferral in days | |
|------|------------------------------------|----------------------|
| | Division of Health Sciences | Division of Sciences |
| 2000 | 114 | 123 |
| 2001 | 66 | 155 |
| 2002 | 107 | 147 |
| 2003 | 55 | 130 |
| 2004 | 95 | 67 |
| 2005 | 112 | 155 |
| 2006 | 66 | 122 |
| 2007 | 50 | 170 |
| 2008 | 56 | 77 |
| 2009 | 89 | 91 |
| 2010 | 44 | 70 |

Please also see the additional table below that shows the median deferral time and number of deferrals taken for PhDs in all Academic Divisions (Health Sciences, Sciences, Humanities, Commerce), broken down by year from 2000 – 2011.

| Year | Total number of PhD candidates | Median time deferral taken (EFTS) | Number of deferrals in first year of PhD | Number of deferrals in second year of PhD | Number of deferrals in third year of PhD | Number of deferrals above third year of PhD | Total deferrals taken |
|------|--------------------------------|-----------------------------------|--|---|--|---|-----------------------|
| 2000 | 725 | 2.84 | 1 | 3 | 7 | 8 | 19 |
| 2001 | 743 | 2.7 | 4 | 4 | 3 | 6 | 17 |
| 2002 | 759 | 2.88 | 6 | 6 | 8 | 16 | 36 |
| 2003 | 766 | 2.465 | 6 | 4 | 5 | 11 | 26 |
| 2004 | 811 | 1.975 | 10 | 7 | 6 | 11 | 34 |
| 2005 | 849 | 2.46 | 7 | 5 | 8 | 14 | 34 |
| 2006 | 976 | 1.69 | 10 | 11 | 7 | 8 | 36 |
| 2007 | 1048 | 2.285 | 7 | 15 | 4 | 18 | 44 |
| 2008 | 1103 | 1.57 | 11 | 6 | 5 | 6 | 28 |
| 2009 | 1206 | 1.58 | 14 | 16 | 7 | 6 | 43 |
| 2010 | 1257 | 1.24 | 13 | 11 | 1 | 3 | 28 |
| 2011 | 1257 | 0.665 | 5 | 10 | 5 | 2 | 22 |

In case it is helpful, we have also included a copy of a research paper that was completed by University of Otago staff members. The paper discusses factors contributing to PhD completion rates and explains University of Otago rates of submission and completion by Academic Division.

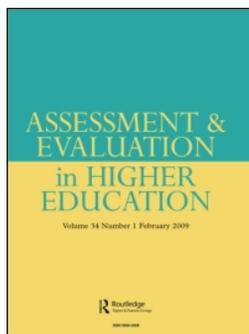
As noted in our email to you on 1 March 2022, the University is interested for its own purposes to collate the information you have requested that the University does not currently hold. However, our staff are very busy with tasks related to COVID-19 and other matters, which is having an impact on the operations and focus of the University at this time. We hope to be able to undertake this work when it is practically manageable.

We will endeavour to provide this information to you once it is practically manageable to do so. The expected timeframe for this is unknown at this stage, however please feel free to get back in touch with us if you have not heard from us. In the meantime, our Graduate Research School would be happy to discuss with you any specific issues or concerns you may have.

Yours sincerely



Kelsey Kennard
 Official Information and Compliance Coordinator
 Office of the Registrar



Factors contributing to high PhD completion rates: a case study in a research-intensive university in New Zealand

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Factors contributing to high PhD completion rates: a case study in a research-intensive university in New Zealand

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ABSTRACT

This exploratory study determined PhD completions at a research-intensive university in New Zealand and considered factors affecting PhD completions. Completion data were calculated for PhD cohorts at the University of Otago from 2000 to 2012 ($n = 2770$) and survival models determined whether gender, enrolment status, age at admission, citizenship, scholarship status and academic field influenced completion. The impact of the doctoral programme and the research environment was also considered. Across all cohorts, 83% submitted their thesis for examination (17% withdrawal). The median submission time was 3.4 years for full-timers, with a median completion time (to award of degree) of 4.1 years. Survival modelling showed that completion can be enhanced by having mainly full-time candidates, but also allowing periods of part-time enrolment near submission, recruiting a large international cohort, and providing three year scholarships. Health science candidates had the highest submission percentages, while commerce candidates submitted in the fastest times. There were only minor or negligible effects of gender and age at admission. Other factors contributing to high submission rates included recruiting quality candidates, close monitoring during candidature, provision of research training, a vibrant research culture, a personal performance coach, high-quality supervision and funding incentives for candidates who submit in under four years.

KEYWORDS

Doctoral education; PhD; completion; duration; survival methods

Introduction

Attrition rates and time to completion of PhD candidates has internationally become a concern of government, universities and the candidates themselves. (Bourke et al. 2004, 1)

Many stakeholders have a vested interest in high PhD completions and fast completion times, as Bourke et al. (2004) have noted. In order for stakeholders – particularly governments and universities – to make informed decisions regarding doctoral education policy and practice, it is important to have good baseline completion data, as well as a knowledge of factors influencing completion. Doctoral candidates are also concerned about completion rates, and, as many have to fully or partially fund their study, they want to ensure they are investing wisely.

Before continuing, it is important to provide definitions (Table 1) and to recognise that these are not always given in reports on completion statistics, which makes interpretation and cross-institution comparisons difficult. Palmer (2015) provides an excellent synthesis of the different methods to calculate completion statistics. The term ‘completion rate’ is typically used to define the percentage of

Table 1. Definitions of key terms used in analysis of completion data.

| Term | Definition |
|--|---|
| Submission percentage | Percentage of the commencing cohort who submitted their thesis for examination |
| Completion percentage | Percentage of the commencing cohort who completed their PhD (i.e. passed the examination, made any required amendments and were awarded the degree) |
| Submission or completion rate | Percentage who submitted or completed over a specified time period e.g. 4 years |
| Attrition | Percentage of the commencing cohort who withdrew from study |
| Candidacy time (or time to submission) | Number of years from enrolment to submission of the thesis for examination, excluding any time away from study |
| Completion time (or total completion time or time-to-degree) | Number of years from enrolment to award of the degree, including any time away from study (e.g. holidays or deferrals), as well as the time for examination, but not including time to graduation |

candidates from a particular cohort who have submitted their thesis for examination. However, this term can be misleading because these candidates have not yet completed, and this is not a rate unless a time period is specified. Therefore, we make a distinction between submission and completion – both for percentages and times. Additionally, although doctoral and PhD are often used interchangeably in the literature, in this article we are focusing on PhD candidates.

The scant reports in the literature indicate problems with attrition and completion times for PhD candidates. However, many articles are very dated, especially given changes in recent years in PhD education. For example, a seminal report for US universities analysed completion data across 30 institutions for cohorts from 1992 to 1993 and 1994 to 1995 (Council of Graduate Schools 2008). The authors found completion rates of just 46% after seven years and 57% after ten years. Even taking into account the US PhD education system, which usually involves two years of coursework before supervised research, these data are worrying. Elgar (2003) collated completion data for PhD candidates in Canadian universities. For 14,402 PhD candidates in cohorts from 1985 to 1988 across a range of disciplines, he found that the percentage completing varied from 40% in English to 83% in biochemistry. The completion times were estimated as about 4 to 5 years.

The completion statistics from the UK and Australia show a brighter picture, but some of the data are more recent, which may reflect improvements that have occurred in PhD education, and some are from only one institution. In these systems, PhD study is focused on a research project, although research training may occur particularly in the first year. The expectation for candidates is to complete within 3–4 years. Fuller (2015) reported that 70–87% of full-time PhD candidates across 30 institutions in the UK completed in 7 years. In Australia, for 2647 candidates commencing a PhD in early 1992, by the end of 1999 an average of 53% completed (Martin, Maclachan, and Karmel 1999). Better completion rates were found by Bourke et al. (2004), with one study of 1988–1999 cohorts at an Australian university showing 51% submitted their thesis in 4 years, with 70% in 6 years. More recently, Palmer (2015) presented a range of completion statistics for the top 10 universities in Australia, with completion ratios (proportion of annual completions relative to commencements) of 62–72%.

The PhD training system in Europe varies according to the country, since in some countries PhD candidates are employed as staff, teaching while researching. Consequently, the average length of study tends to be longer. When analysing European country reports for the status of PhD education, Kehm (2004) noted that all countries were concerned about duration of study, which tended to be 4–6 years. She also found that attrition was an issue, although not many statistics were reported.

Many researchers have explored factors influencing both completion and attrition of PhD candidates. In an analysis of improved PhD completion rates in Norway, Kyvik and Olsen (2014, 1670) categorised the factors influencing completion rates into: the doctoral training system; the doctoral programme

and the research environment; the doctoral candidates; the cultural and social context; and differences between academic fields. We draw on similar categories in this article.

New Zealand context

New Zealand has eight universities (all publicly funded) and all award PhD degrees. Given the similarity in structure and funding between the universities, the 'New Zealand PhD' consists of about 3–4 years of supervised research, and coursework is seldom required (the exceptions are research methods or statistical courses). Entry to the PhD is typically via completion of an undergraduate degree and either an Honours degree (one year of postgraduate coursework including a research dissertation) or a Master's degree including a substantive research component.

The government funding for PhD candidates is geared towards completion in 4 years. Annual enrolment funding accounts for about 65% of total funding and is normally for up to 4 years. Upon completion, the university receives further significant funding (about 35%), from the nationally-run Performance-based Research Fund (PBRF). That PhD candidates have to pay fees at NZ universities likely provides a strong imperative for timely completion – both for candidates who self-fund and for those on scholarship funding (e.g. if the scholarship does not cover fees or if their scholarship expires before they have submitted their thesis). All universities offer scholarship support from internal funding; there is only minimal scholarship funding from government for specific groups. In 2006, the government introduced a new policy to attract more international PhD candidates: international PhD candidates resident in NZ would only pay domestic fees (typically NZ\$5–10,000 a year).

In New Zealand, the only published research on completion rates occurred as part of a study on the impact of the PBRF on retention of PhD candidates. This study reported an average 60% of PhD candidates for the 1995–1997 cohorts across the universities completed in 9 years (Ministry of Education 2007). Given the paucity of research on PhD completions in New Zealand universities, this study aimed to analyse PhD completions at a research-intensive university and to consider factors influencing completion.

Methods

Case study setting

To address the aims, a case study was undertaken at the University of Otago (Otago), a research-intensive university in NZ. Otago is the oldest in the country, with a QS rating of five stars plus (<http://www.topuniversities.com/university-rankings>). In 2015, there were about 21,000 students enrolled, including approximately 1300 PhD candidates across four broad academic fields (or divisions): health science, science, humanities and commerce. The University expects submission of PhD theses in 3 years, but candidates can have a maximum of 8 calendar years. Candidates can enrol continuously throughout the year, and may enrol either full-time (1 EFT – equivalent full-time), or part-time (0.5 EFT). Candidates can take a deferral during their study; they are not charged fees and the time clock for their PhD duration is paused. Otago has increased the number of doctoral scholarships available each year from 80 in 2000 to about 180 in 2012. Importantly, these scholarships are available to both domestic and, since 2006, international candidates and include an annual stipend (NZ\$25,000 in 2012, which should be sufficient to cover living expenses for a year), as well as tuition fees, but the tenure is only 3 years. After this time PhD candidates normally self-fund to completion, although some departments may offer financial support. A small proportion of international PhD candidates will study with scholarship support from their home country, while others – both domestic and international – will self-fund their entire study. If candidates submit their thesis for examination within 4 EFT years, they normally get a 'Postgraduate Publishing Bursary', which provides up to 3 months' funding at scholarship rate to enable publishing of their research while their thesis is examined.

Administration of PhD candidates is done centrally by the Graduate Research School, who have an extensive database including details of their characteristics, progress and completion. The Graduate Research School is responsible for promoting best practice in doctoral education, and helps ensure consistency of PhD administrative practices.

At Otago, candidates are only accepted into the PhD programme if they have a strong academic record and can demonstrate capacity for research. This means that Otago candidates should be well equipped for PhD study. Following enrolment, candidates complete a student-supervisor agreement, which, although only made compulsory in 2012, was commonplace for earlier cohorts. The university closely monitors progress during candidature. All PhD candidates have an initial period of provisional enrolment (6–12 months), during which candidates are set targets to achieve and their progress is formally monitored. Once confirmed, formal progress meetings occur every year. There is an expectation of submission in 3 years, with this target submission date reinforced through the University's student management system.

The Graduate Research School encourages vibrant graduate research cultures in departments through workshops for heads of departments in Otago's leadership programme, as well as sessions for supervisors and postgraduate coordinators. Recently an annual award has been introduced to recognise departments providing the best graduate research culture. The School also oversees research and transferable skills training through optional workshops and short courses. This professional development programme is much smaller than those found in the UK, since it relies on internal funding. A dedicated personal coaching service for graduate research candidates assists them with goal setting, keeping on track and avoiding procrastination.

The University promotes team supervision and solo supervision is only allowed when the candidate is supported by a committee. Candidates at Otago are experiencing high-quality supervision, evidenced by exit survey data (unpublished), as well as graduate opinion data. For example, in the 2012 exit survey, of the 114 PhD graduates who responded (response rate of 59%), 94% were 'very satisfied' or 'satisfied' with their quality of supervision. Although mandatory training has just been introduced for new supervisors, Otago has provided a comprehensive programme of support for supervisors for many years, and this is well attended and highly regarded. Excellent supervision is recognised through university-wide annual awards.

Data collection

Data were collected from a range of sources. First, the submission and completion percentages and times were extracted from the Graduate Research School database for PhD cohorts for the time period 2000–2012 ($n = 2770$), with data extracted on 31 January 2015. At this time 520 (19%) had not yet submitted or completed. Second, using the categories of Kyvik and Olsen (2014), other factors were extracted from the database to determine possible influences on completion rates. For factors relating to 'doctoral candidates', data extracted included gender, age at admission, citizenship (i.e. domestic or international) and enrolment status (full-time, part-time, or variable with periods of full-time and part-time enrolment). One measurable factor in the 'doctoral training system' is funding, so data were extracted regarding whether the candidate received an Otago scholarship. For 'differences between academic field', the disciplinary area was extracted for each candidate. Finally, regarding the 'doctoral programme and the research environment', the wider university environment was considered.

Data analyses

We used survival methods as a novel approach for analysis of the PhD completion data ($n = 2770$). This is an appropriate method to use for data extracted on a particular date (the census), where all data can be used for inference including data for those who have not yet submitted or completed their PhD. The influence of variables on submission times can also be statistically assessed. Finally, the use of models with multiple variables means that the observed effects of each characteristic are all adjusted for the

others. Survival methods using Cox regression allowed analysis of the probability of PhD submission and completion, and whether various factors relating to PhD candidates and the academic field had an influence. Descriptive statistics (excluding the 520 candidates still continuing, $n = 2250$) were also produced for completion data including submission percentages, 4 year submission rates, median candidacy and completion times, and interquartile ranges.

Estimates produced from the survival method are hazard rate ratios which compare submission or completion rates (i.e. the speed of submitting or completing within the time of the study). The two Cox regression models (submission and completion) included terms for gender of the candidate, age at admission, citizenship, enrolment status, scholarship and academic field. Stata v13 (StataCorp, Stata Statistical Software: Release 13. College Station, TX: StataCorp LP2013) was used for all analyses.

Results

In this section we first report the enrolment numbers and characteristics of the cohorts and then consider the completion statistics, focusing on submission percentages and candidacy times for brevity. We then present the findings of the survival analysis regarding factors influencing submission rates.

Enrolment numbers and characteristics of the cohorts

For the period 2000–2012, the number of candidates enrolling for their first year in a PhD at Otago climbed from 158 to 272 (Figure 1). There were roughly even numbers of men and women enrolled in the PhD (Figure 2(a)), and most PhD candidates were full-time, although a number of candidates had variable enrolment (i.e. periods of full-time and part-time study), and a smaller fraction (about 10%) were purely part-time (i.e. 0.5 EFT) (Figure 2(b)). It is notable that, while most candidates began study full-time, many switched to part-time once their scholarship ran out or employment opportunities arose. This is why we see higher variable enrolment for earlier cohorts; candidates in later cohorts nearer to the census date are more likely to be full-time. Figure 2(c) reveals a considerable growth in international candidates, particularly since 2006, which is when the government introduced domestic fees for international PhD candidates. Most PhD candidates were enrolled in the health science and science academic fields, followed by humanities and then commerce (Figure 2(d)).

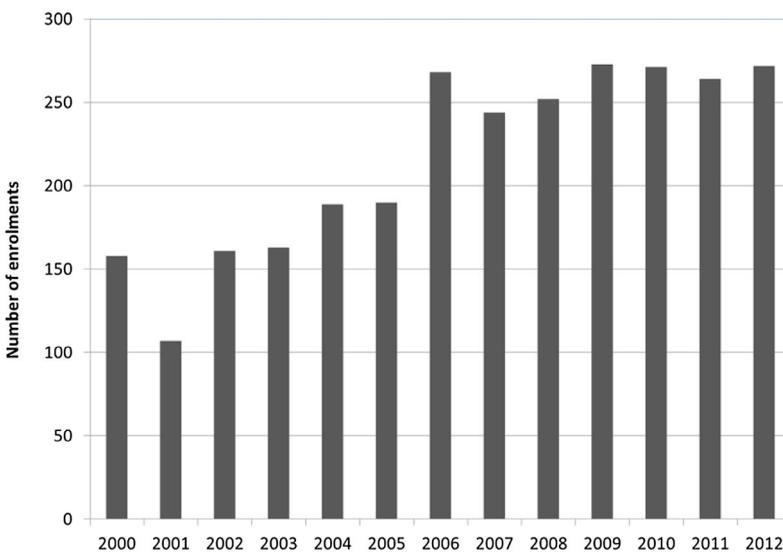


Figure 1. Enrolment numbers of new PhD candidates for cohorts from 2000 to 2012.

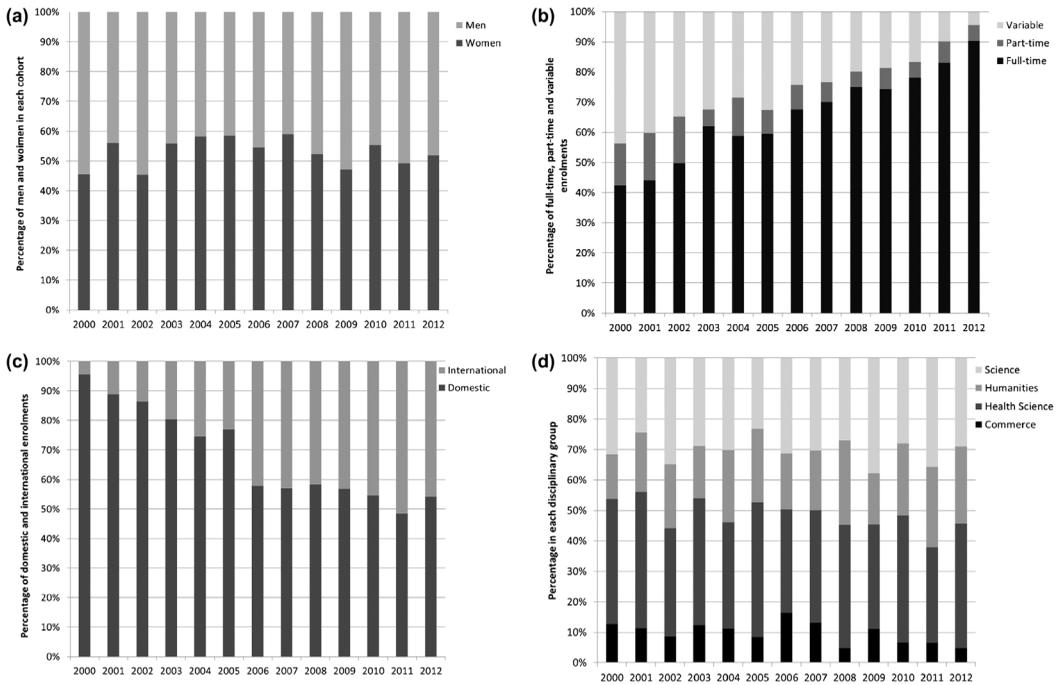


Figure 2. Characteristics of PhD cohorts: (a) gender; (b) enrolment status; (c) citizenship and (d) academic field.

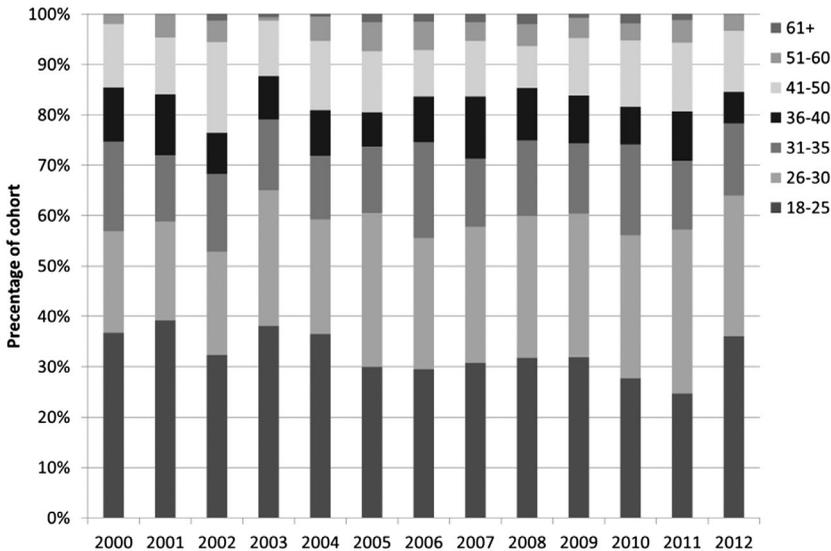


Figure 3. Age (in years) at admission of new PhD candidates for cohorts from 2000 to 2012.

As Figure 3 shows, about a third of new PhD candidates were aged 18–25 years, with another 25–30% in the 26–30 year bracket. A fairly consistent 15% were aged 31–35 years, with about 10% aged 36–40 years and 12% 41–50 years. Only 5% were over 50 years old.

Submission and completion statistics

Figure 4(a) shows high submission percentages for PhD cohorts from 2000 to 2008. For these cohorts, 77–88% submitted their theses, 73–86% completed their degree and only 11–23% withdrew. For the 2000–2008 cohorts, the average submission percentage was 81%, with 79% completing, 16% withdrawing and an average 2% still studying. From 2009 on the submission percentages fall as some candidates (particularly part-timers) are still continuing. As Table 2 shows, for the 2250 candidates from the 2000 to 2012 cohorts who had either completed or withdrawn, the submission percentage was 83% (17% withdrew). The most common reasons for withdrawing were personal circumstances (17%), transfer to Master's degree (10%), loss of contact with the candidate which meant the University withdrew them (8%), and 7% for each of lost interest/motivation, medical reasons and work commitments. Figure 4(b) shows the median completion time for the whole cohort (i.e. including all enrolment types) is 4.4 years (i.e. 4 years 5 months), about six months longer than the median candidacy time (3.7 years) (Table 3). The completion time is longer because it includes periods of deferral, and the examination period, including time for corrections. The median candidacy time has been decreasing steadily from 4.4 years for the 2000 cohort to 3.3 years for those beginning in 2009. The completion time has been decreasing steadily from 4.4 years for the 2000 cohort to 3.3 years for those beginning in 2009.

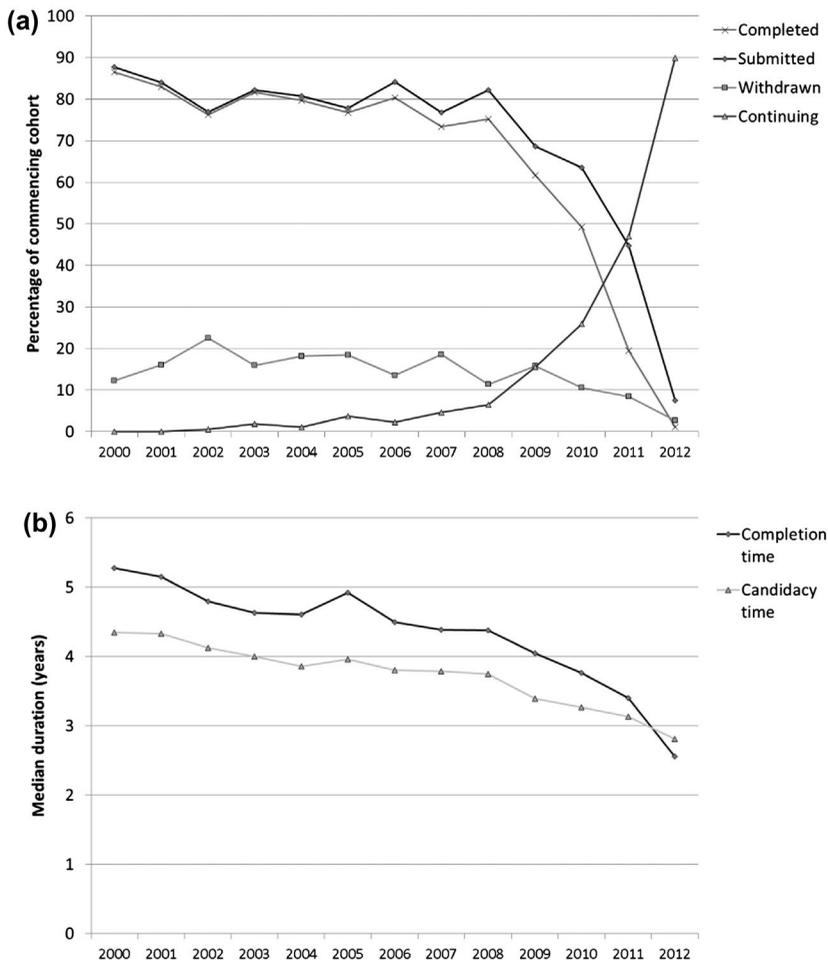


Figure 4. (a) Percentages completing, submitting, withdrawn and continuing and (b) median candidacy and completion times, for PhD cohorts from 2000 to 2012 as of January 2015.

Table 2. Average submission and withdrawal percentages for the 2000–2012 cohorts (excluding the 520 candidates still continuing in January 2015).

| Characteristic | Variable (n) | Percentage submitting (withdrawing) |
|--------------------|---|-------------------------------------|
| Enrolment | All candidates (n = 2250) | 83 (17) |
| | Full-time (n = 1544) | 83 (17) |
| | Part-time (n = 164) | 67 (34) |
| | Variable (n = 542) | 88 (12) |
| Gender | Men (n = 1053) | 82 (18) |
| | Women (n = 1197) | 85 (15) |
| Citizenship | Domestic (n = 1468) | 83 (17) |
| | International (n = 782) | 84 (16) |
| Scholarship status | Otago scholarship (n = 1245) | 86 (14) |
| | No Otago scholarship (n = 1005) | 80 (20) |
| Academic field | Health Science: Science: Humanities: Commerce (n = 871: 695: 450: 234) | 88: 84: 79: 74 (12: 16: 21: 27) |

Table 3. Median candidacy and completion times for PhD cohorts from 2000 to 2012 (excluding the 520 candidates still continuing in January 2015).

| Characteristic | Variable (n) | Median candidacy time in years (interquartile range) | Median completion time in years (interquartile range) |
|--------------------|---------------------------------|--|---|
| Enrolment | All candidates (n = 2250) | 3.7 (3.2, 4.5) | 4.4 (3.7, 5.4) |
| | Full-time (n = 1544) | 3.4 (3.0, 4.0) | 4.1 (3.6, 4.7) |
| | Part-time (n = 164) | 5.6 (4.2, 6.7) = 2.8 EFT | 6.1 (4.7, 7.8) = 3.0 EFT |
| | Variable (n = 542) | 4.5 (3.8, 5.5) | 5.5 (4.5, 6.7) |
| Gender | Men (n = 1053) | 3.7 (3.1, 4.4) | 4.4 (3.7, 5.4) |
| | Women (n = 1197) | 3.7 (3.2, 4.5) | 4.4 (3.8, 5.4) |
| Citizenship | Domestic (n = 1468) | 3.9 (3.3, 4.9) | 4.6 (3.9, 5.7) |
| | International (n = 782) | 3.4 (3.0, 3.9) | 4.1 (3.6, 4.7) |
| Scholarship status | Otago scholarship (n = 1245) | 3.5 (3.1, 4.2) | 4.2 (3.7, 5.1) |
| | No Otago scholarship (n = 1005) | 4.0 (3.3, 5.0) | 4.7 (3.9, 5.9) |
| Academic field | Health Sci. (n = 871) | 3.8 (3.2, 4.6) | 4.4 (3.8, 5.4) |
| | Science (n = 695) | 3.6 (3.1, 4.3) | 4.2 (3.7, 5.1) |
| | Humanities (n = 450) | 3.7 (3.2, 4.7) | 4.6 (3.9, 5.9) |
| | Commerce (n = 234) | 3.5 (3.0, 5.2) | 4.4 (3.7, 5.7) |

Some researchers (e.g. Bourke et al. 2004) assume that the completion percentage is the same as the submission percentage, but in our case there is a small 2% difference. Although very few candidates at Otago who submit their thesis for examination fail (less than 0.05%), about 5–6% receive a revise and resubmit result; 94–95% typically pass with either minor or major corrections. The revise and resubmit result necessitates major revisions that can take 6–12 months, and many will never resubmit their thesis. Thus, like Green and Powell (2005), we urge caution with assuming that the completion percentage is the same as the submission percentage.

The completion statistics from Otago are much better than those reported by the Ministry of Education (2007) for earlier cohorts across NZ universities, who estimated that only 60% of PhD candidates completed in 9 years. However, their average hides significant differences between the universities. For example, some universities have much larger cohorts of part-timers and distance students, which could lead to lower completion rates. Otago's completion rates also compare very favourably to overseas data, with lower attrition than most reported studies from North America, Europe, the UK and Australia.

Factors influencing submission rates

Here we present the results from survival modelling, with the influence of the funding regime on submission first reported, then candidate characteristics, and finally academic field.

Table 4. Estimates from the Cox regression model for the influence of characteristics of the candidates on the rate of submission and completion.

| Characteristic | Levels | Submission | | Completion | |
|------------------|----------------------|--------------|-------------------------|--------------|-------------------------|
| | | Hazard Ratio | 95% confidence interval | Hazard Ratio | 95% confidence interval |
| Enrolment | Part-time | 1 | | 1.000 | |
| | Full-time | 3.712 | (2.97, 4.64)* | 3.120 | (2.47, 3.94)* |
| | Varied | 1.482 | (1.19, 1.845)* | 1.207 | (0.957, 1.522) |
| Gender | Men | 1 | | 1 | |
| | Women | 1.104 | (1.007, 1.21)* | 1.086 | (0.986, 1.196) |
| Age at admission | | 1.000 | (0.994, 1.006) | 0.996 | (0.99, 1.002) |
| Citizenship | Domestic | 1 | | 1 | |
| | International | 1.407 | (1.263, 1.568)* | 1.232 | (1.1, 1.379)* |
| Scholarship | No Otago Scholarship | 1 | | 1 | |
| | Otago Scholarship | 1.154 | (1.045, 1.274)* | 1.189 | (1.071, 1.32)* |
| | Humanities | 1 | | 1 | |
| Academic field | Commerce | 1.525 | (1.266, 1.838)* | 1.373 | (1.128, 1.671)* |
| | Health Science | 1.199 | (1.048, 1.372)* | 1.330 | (1.154, 1.533)* |
| | Sciences | 1.169 | (1.017, 1.343)* | 1.339 | (1.156, 1.551)* |

*Indicates 95% confidence intervals that do not include 1 ($p < 0.05$). Selected p -values are reported in the text.

Funding regime

Several factors combine uniquely at Otago to provide a 'carrot and stick' approach. Most New Zealand universities offer scholarships, and at Otago these include tuition fees, but importantly the scholarship is available for 3 years. The University scholarship scheme is very competitive meaning only candidates achieving a high first class average (A or A+) in their Honours or Master's degrees are likely to be successful. Thus, we believe that candidates on scholarships are of a very high calibre, and across all cohorts, 57% were on a university scholarship during at least some of their candidature.

Candidates with an Otago scholarship have a submission percentage of 86% compared to 80% for those not on these scholarships (Table 2). When allowing for enrolment type, gender, age at admission, citizenship and academic field, survival modelling showed that candidates on a scholarship generally submitted at a rate 15% higher than those without a scholarship ($p < 0.001$) (Table 4). The median candidacy time for those on an Otago scholarship was 3.5 years, with 4.0 years for those without (Table 3). Our findings regarding the importance of funding contrast those of Platow (2012), but are similar to Ehrenberg and Mavros (1995), and Sheridan and Pyke (1994), although the latter study found that increased funding for PhD candidates almost tripled the odds of completing.

Notably, the average percentage of candidates on a University scholarship increased from 43% (2000–2005) to 64% (2006–2012), with this shift likely contributing to higher submission percentages and faster candidacy times in more recent years. The limitation of scholarship support to only 3 years provides strong motivation for completion in this time. This is especially the case for international candidates who also have visa restrictions, with 3.5 years for PhD study.

Alongside the 'stick' of the 3 year maximum on scholarship funding, a unique aspect of Otago is providing a 'carrot' with a Postgraduate Publishing Bursary to encourage and reward submission in less than 4 years EFT. The Bursary provides up to 3 months of funding at the scholarship rate for the publishing of research outputs.

Enrolment status

Figure 5 shows the influence of enrolment status on submission percentages and candidacy times for the cohorts. For full-time PhD candidates who have submitted their thesis, 78% did so within 4 years. However, the 4 year submission rate improves for cohorts post-2005, with an average of 85% full-time candidates submitting their thesis in 4 years or under. The highest submission percentage is for candidates on variable enrolment (88%), followed by full-time candidates (83%), with part-timers the

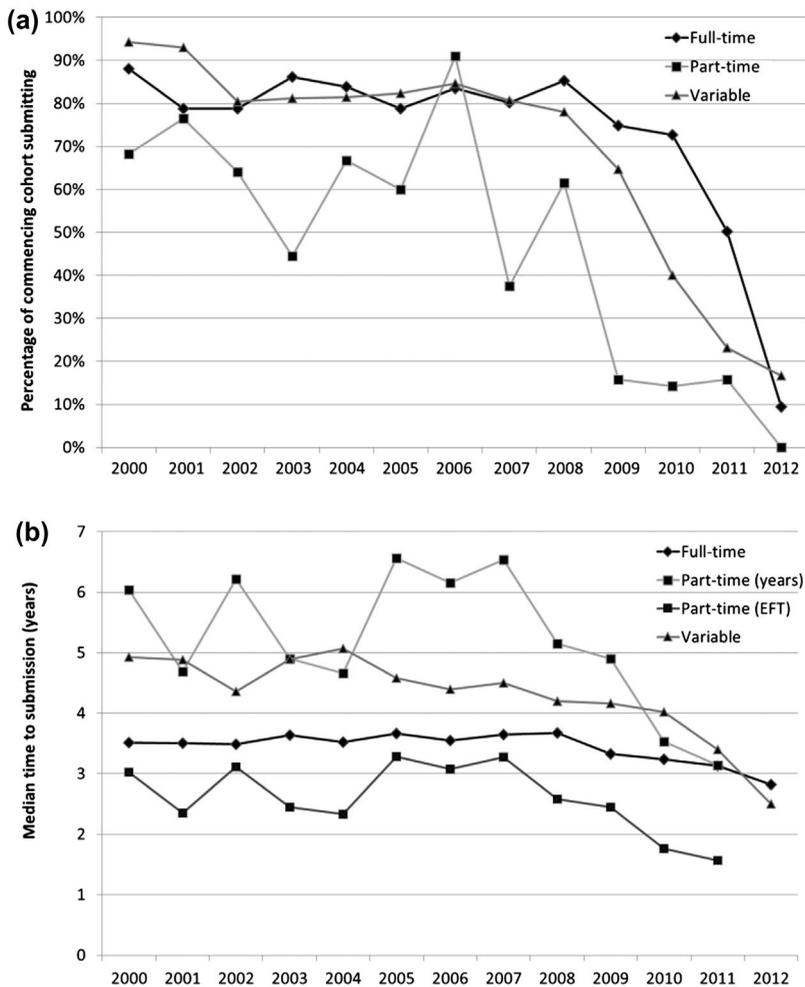


Figure 5. Submission percentages (a) and median candidacy times (b) according to enrolment status.

lowest (67%) (Table 2). Allowing part-time candidature throughout enrolment poses a considerable risk to completion. As expected, full-time candidates have the fastest candidacy times (median of 3.4 years), although in terms of equivalent full time study (EFT), part-time candidates actually submit in the fastest time (2.8 years) (Table 3). Estimates from the Cox regression (Table 4) indicate that, on average (and adjusting for the other variables), full-time candidates submit much faster than part-timers (at a 270% higher rate), and those on variable enrolment submit at a rate 48% higher than part-timers ($p < 0.001$). Our observation of comparatively fast EFTS candidacy time for part-timers was also noted by Bourke et al. (2004), who suggested this may be due to part-time candidates working more than half-time on their theses. Another possibility is that part-timers are more efficient in their PhD study, due to competing demands on their time.

Age at admission and gender

When adjusting for gender, citizenship, academic field, enrolment status and whether or not they had a scholarship, age at admission is not related to submission ($p = 0.932$) (Table 4). Gender has an impact on the rate of submission with modelling showing that women submit at a 10% higher rate than men ($p = 0.035$). The descriptive data do not reflect this difference, with women and men having a very

similar candidacy time of 3.7 years (Table 3), but the average submission percentages are higher for women (85% compared to 82% for men – see Table 2).

Past research on the influence of gender has shown mixed results, with some studies indicating no influence (e.g. Seagram, Gould, and Pyke 1998; Wao and Onwuegbuzie 2011; Wright and Cochrane 2000), while others have found that women have lower completion percentages (e.g. Baker 1998), as well as longer candidacy times (e.g. Jiranek 2010), at least in the science disciplines. Our finding that age at admission did not have a significant influence on PhD submission, agrees with Wao and Onwuegbuzie (2011), and Wright and Cochrane (2000), who noted this in 4 year submission rates (younger candidates were more successful for 10 year rates).

Citizenship (domestic/international)

As shown in Table 2, international candidates have a slightly higher submission percentage than domestic candidates (84 and 83%, respectively). Modelling shows that citizenship has an impact on the submission rate when all other factors are considered (Table 4), with international candidates submitting at a 41% higher rate than domestic candidates ($p < 0.001$). The descriptive statistics illustrate this with a median candidacy time of 3.4 years for international candidates compared to 3.9 years for domestic candidates (Table 3). Our findings that citizenship significantly influences PhD completion are in accord with past research (e.g. Council of Graduate Schools 2008; Jiranek 2010; Platow 2012). Like Jiranek, we found that international candidates submit their thesis for examination about 6 months faster than domestic candidates.

Academic field

The highest submission percentages occur in health science (88%) and science (84%), followed by humanities (79%) and commerce (74%) (Figure 6(a), Table 2). However, as shown in Table 3, there is a different pattern for median candidacy times, with candidates in commerce the fastest, followed by science, humanities and health science. Modelling results show that, compared to humanities, all other academic fields submit their PhDs at a higher rate when adjusting for all variables (Table 4). Commerce is 53% higher than humanities (1.53 (1.27, 1.84), $p < 0.001$), health sciences 20% higher (1.20 (1.05, 1.37), $p < 0.008$), and sciences is 17% higher (1.17 (1.02, 1.34), $p < 0.028$); and, moreover, commerce submission rates are significantly higher than health science and science. The significant influence of academic field on submission and completion rates is similar to past research (e.g. Bourke et al. 2004; Council of Graduate Schools 2008; Elgar 2003; Golde 2005; Seagram, Gould, and Pyke 1998; Wright and Cochrane 2000), which tends to show better submission or completion percentages for PhD candidates in the sciences and natural sciences compared to those in arts and humanities.

Discussion and implications

Analysis of PhD cohorts at the University of Otago from 2000 to 2012 has revealed high submission percentages, and fast candidacy and completion times. For the 2250 candidates who had finished at the time of the census, 83% submitted, with an attrition of 17%. The median candidacy time for full-timers was 3.4 years. In comparison with published data, these statistics – particularly the candidacy time – are amongst the best globally. However, as noted earlier, published reports on PhD completions are rather sparse, different reporting may be used, and many comparative studies are rather dated, making it difficult to draw definitive conclusions. We continue by discussing the main factors contributing to high submission rates, provide a cautionary note, and then study limitations.

Factors contributing to high submission rates

Survival modelling showed the most significant factors influencing submission and completion rates were enrolment status, citizenship, academic field and scholarship funding; gender and age at admission had a more minor or negligible influence. Regarding enrolment status, the main risk factor was

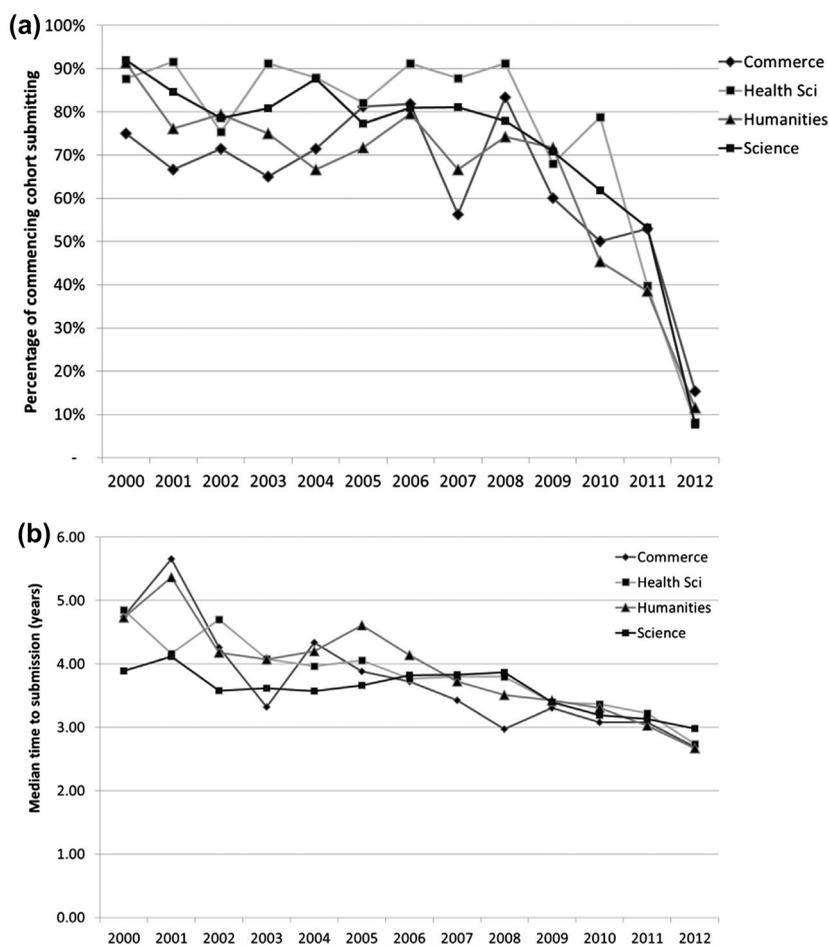


Figure 6. Submission percentages (a) and median candidacy times (b) according to academic field.

part-time enrolment for the *duration* of study; only 67% of part-time candidates submitted compared to 83% full-time. However, it was notable that the highest submission percentages (88%) occurred for candidates with variable enrolment. Most of these candidates started their candidacy studying full-time, but later switched to part-time, often once their scholarship ran out or employment opportunities arose. Having mainly full-time candidates and allowing *periods* of part-time enrolment appear to be good strategies for improving submission percentages.

International candidates had higher submission rates than domestic candidates. Although the submission percentages for international and domestic candidates were similar (84 and 83%, respectively), the international candidates were much faster to submit (3.4 years compared to 3.9 years). The percentage of international candidates increased significantly following the government policy change in 2006, so by 2012 about 45% of the cohort were international. Two factors are likely leading to higher completion by internationals: better funding and visa restrictions. International candidates are more likely to pursue a PhD if they secure scholarship funding, and, indeed, for our cohorts at least 70% had scholarships, compared to 54% for domestic candidates. In NZ, the standard student visa for international candidates is 3.5 years, meaning that most candidates will aim to complete within this time to avoid having to extend their visa. If seeking to improve completion statistics, allowing a large cohort of international candidates could be one strategy, although this would need to be coupled with scholarship support. However, the desirability of this strategy will depend on government and university policies.

The New Zealand government seeks more skilled migrants, so, in 2006, they introduced a policy to allow international PhD candidates to pay domestic fees, and this led to substantial and continuing growth in international enrolments. The flow of students is not one way: completing a qualification or postdoc overseas is almost a rite of passage into academia for New Zealand students. Indeed, NZ universities have some of the highest rates of foreign-educated or foreign-born academics – over 70% at Otago.

The academic field significantly influenced submission rates, again in keeping with past research (e.g. Bourke et al. 2004; Council of Graduate Schools 2008; Elgar 2003; Golde 2005; Seagram, Gould, and Pyke 1998; Wright and Cochrane 2000). The highest submission percentages were in health science, then science, humanities and commerce. However, the fastest candidacy times were in commerce (3.5 years), followed by science, humanities and then health sciences (3.8 years). Past research had revealed strong disciplinary differences in terms of enrolment status, getting an early start on research, frequency of supervision meetings, peer support and funding. Regarding enrolment status, in our study only 2% of candidates were part-time in sciences, 8% in health science, 9% in commerce and 12% in humanities. Part-time enrolment poses a significant risk to completion and obviously increases candidacy time in terms of calendar years.

Generally, researchers have noted better funding for PhD candidates in sciences and health sciences, but in our case only 46% of health science and 67% of science candidates received a scholarship (but some others will be on research grant funding), with commerce 67%, and humanities 71%. We did note strong disciplinary differences in the percentage of international candidates, and, because citizenship effects both submission percentages and times, this is having a significant influence. The PhD cohorts in commerce had far more international candidates (57%) than any other academic field (science is 43%, humanities 31% and health science 28%), and our analysis has shown faster submission times for international candidates. The finding of commerce being the fastest discipline to submit echoes the results of Bourke et al. (2004) research for an Australian university, where they observed that candidacy times for full-time candidates in commerce were among the fastest of the academic fields at 3.3 years.

Funding also contributed to high submission rates. Past research has shown mixed results, with Platow (2012) noting that having a scholarship did not lead to faster submission amongst 1258 PhD graduates from the top eight Australian universities, but Ehrenberg and Mavros (1995) and Sheridan and Pyke (1994) finding scholarships did improve completion rates. It may be that the *duration* of the scholarship is an important factor to consider. Survival modelling showed that candidates with a scholarship submitted at a higher rate (86% compared to 80%), and were faster to submit (3.5 years compared to 4 years). That the duration of the scholarship is aligned with the target submission period is a powerful driver for timely submission. However, since the scholarship provides 3 years funding and the median time to completion at Otago is 3.4 years for full-timers, there is still a shortfall of funding for many candidates until they submit and can obtain the Postgraduate Publishing Bursary. This can lead to financial stress, as noted in our population by Cornwall et al. (2017), and a similar problem occurs in Australia, with scholarship support falling short of time to submission (ACOLA 2016).

There are two other funding-related factors to consider: reward for timely completion and the broader funding environment. The University encourages timely submission with the Postgraduate Publishing Bursary providing up to 3 months funding at a scholarship rate for all candidates submitting in under 4 EFT years. It is also likely that the broader funding environment is driving higher completion rates. In NZ, the combination of 4 years for submission and candidates paying fees are likely important drivers for timely completions. In the UK, where some universities have comparable completion rates, the funding environment is also encouraging submission within 4 years, by providing sanctions to the university if target submission rates, such as 60 or 70%, are not met (Humphrey, Marshall, and Leonardo 2012). In Australia, partly in response to poor completion rates, the funding regime changed from 5 to 4 EFT years, with 70% of funding weighted to completion (Cuthbert and Molla 2015). Although domestic PhD candidates have been exempt from tuition fees in Australia, recent funding changes by government now allow for universities to introduce fees (ACOLA 2016).

Alongside the candidate characteristics, academic field and funding influencing PhD completion rates, the wider university environment is also considered. As described in the case study setting, there

is central oversight of PhD candidature by a Graduate Research School. The School ensures high entry standards are maintained. Internationally, there has been a great deal of concern over entry criteria for PhD programmes, leading to new pathways into the PhD (e.g. ACOLA 2016). The School also ensures close monitoring during candidature. One key aspect is requiring a student-supervisor agreement, and Kehm (2004) has noted that having contractual relationships between candidates and supervisors seems to improve submission times and reduce attrition. Another aspect at Otago is having submission of a research proposal as a common target during the provisional period of enrolment, and Humphrey, Marshall, and Leonardo (2012) showed that this action can increase the probability of submitting a thesis. Annual progress meetings occur every year, and the reports are read by heads of department and relevant deans, to ensure that any issues such as supervision, resourcing or progress are followed up. This centralised monitoring is likely assisting the university to achieve overall high submission percentages, with a relatively narrow gap between the academic fields (74% in commerce to 88% in health sciences). If supervisors have ongoing concerns about progress, the candidate is placed 'under review', which involves close monitoring for 3 months, after which, if progress is satisfactory, they continue, or if not they exit the programme.

The University also provides a range of support for candidates including research and transferable skills training. Humphrey, Marshall, and Leonardo (2012) found engagement in research training increased completion rates, but we did not have the necessary data to establish such a link. Additionally, the presence of a personal performance coach is a unique aspect of support for PhD candidates at Otago. The service has proved successful in assisting candidates through difficult times, with an unpublished internal report showing an associated increase in completion rates.

A cautionary note

It is important to question the assumption that excellent completion rates are indeed desirable. Although Otago takes pride in the high completion rates, there is a downside to having fast candidacy times. Recent research by Cornwall et al. (2017) has found that the pressure to submit may be causing undue stress in PhD candidates. Even within the first year of study, candidates are aware that they must try and complete within 3 years, particularly if on scholarship funding. There is also a concern by some supervisors that 3 years is unrealistic, particularly for experimental work, and that candidates may submit prematurely (e.g. ACOLA 2016). However, as noted earlier, the examination outcomes have been very good for Otago over the last decade, with a fairly consistent 95% passing and only 5% failing their first examination. These examination outcomes seem to negate the conjecture that candidates are submitting too soon.

The desire for faster completions also goes against the grain of 'slow scholarship', a movement arguing that time, unpressured by other demands, is important for scholarly endeavour (Hartman and Darab 2012, 49). Yet perhaps PhD study is one of the few places in academia where slow scholarship can occur, since, at least in the New Zealand and Australian models, the candidate is expected to concentrate almost solely on their research for about 3 years. However, with PhD curricula becomingly more structured with research training and with increasing expectations of engagement in teaching, publishing and outreach activities, the space for slow scholarship may be under threat.

Limitations of the study

A limitation of this study is that data from only one New Zealand university were analysed. However, while not necessarily representing New Zealand universities, we suspect that the statistics presented here may be reflective of other research-intensive universities, since these universities share similar philosophies, funding and approaches towards PhD education. However, future research is required to investigate this assertion. Additionally, as the literature shows, there are few studies undertaken in this field, and, with various definitions used, it is difficult to compare findings. We believe that our focus on

specific rates and the use of survival models means that our study is reliable and provides transparency. Whilst the quantitative findings reported here are robust, there are limitations to the qualitative findings.

Conclusion

This study aimed to analyse PhD submission and completion data at a research-intensive university in New Zealand. A strength of the study was the use of survival analysis to provide a rigorous investigation into factors influencing submission and completion rates. High submission percentages were observed across the University, with 83% submitting and only 17% withdrawing. Moreover, candidacy times were fast, with a median of 3.7 years for all cohorts and 3.4 years for full-time candidates. The findings suggest that PhD completion statistics can be enhanced through factors such as having mainly full-timers but allowing periods of part-time enrolment near submission, recruiting a large international cohort, and having a scholarship scheme with a maximum funding period aligned with the target submission period. There were only minor or negligible effects of gender and age at admission. Other factors contributing to high completions likely include recruiting quality candidates, close monitoring during candidature, provision of research training and a vibrant research culture, a personal performance coach for PhD candidates, high-quality supervision, and funding incentives for candidates who submit in under 4 years.

Future research should explore completion data for other New Zealand universities, to see if they also experience high completion rates. Also, it would be helpful to interview PhD graduates and supervisors to ascertain their views on whether aiming for completion in 3–4 years is appropriate, and, if so, what factors aid timely completion. Finally, we suggest that PhD programme models that focus on supervised research may be the only bastion in academia for slow scholarship, but this assertion should be explored, particularly in the context of recent changes in research training.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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